Establishing an Information System

Ministry of Education

Dakar, Senegal

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20th August 2007
USAID/PAEM

The establishment of a management information system (MIS) whether it be in the private sector, public sector, NGO or governmental organization environment is a difficult task at best and often derailed by institutional squabbles and informational fiefdoms rather than by the lack of money or technology. Establishing an MIS solution is always possible but only if the person responsible for creating the MIS has the support of the top management or manager of the organization. Such support must include the ability to dissolve long entrenched practices, redirect critical resources, and provide an acceptable period of performance to allow for the implementation of a plan of action.

In the United States, as well as many European and Asian countries, a Chief Information Officer (CIO) is the one usually vested with the task of either creating something new which never existed before or cleaning up the previous system. The management of information is very different from the management of a server room and computers of any company, or organization. A CIO's requisite skills could be likened to those of a computer-savvy "bartender." The CIO must have a keen understanding of how computers link the organization with the outside world; he must be a good listener capable of hearing what people have to say about the way their work is organized; and he must be capable of seeing the underlying business processes of the organization and building an information system which directly supports those business processes.

My experience around the world, especially in the developing world, with Ministries of Health and Education, has given me a unique vantage point to make suggestions to both Ministries related to the creation of a Ministry-wide MIS solution. In 1997 I worked in Jamaica to help supervise the creation of a Health Information Management System (HMIS) in the Ministry of Health and funded by USAID. At the same time I arrived in Jamaica the Government made a management decision to decentralize operations and to provide more autonomy at the Parish/District level, including the right to establish an individualized HMIS. My immediate reaction was that one cannot have 6 different companies building the same bridge using different plans, nor can one effectively decentralize the design of the HMIS. If ever there was a need for a centralized approach it is most evident when designing any type of Management Information System. This includes endowing one individual with the task of designing such a solution and giving him the appropriate resources such as knowledgeable staff and certainly a budget – some type of realistic budget.

The CIO is the person who should be most responsible for designing the infrastructure upon which the organization or company rests. He will understand the business requirements and make certain that the systems match those requirements. The CIO will manage a team of hardware and software technicians and act as the conduit through which the goals and desires of the President, the Board, and the Minister of Education or Health are translated into action. The CIO will attend project or divisional level meetings and listen to what needs to be accomplished and then make recommendations on how to accomplish that goal through the appropriate selection of software and hardware. In the private sector, a sales manager will not generally understand computer technology but he will know what he wishes to accomplish. It is the task of the CIO to select the appropriate technological approach to meet a goal.

While the CIO position got its start in the private sector, it is now seen as a vital role in the management of an organization, be it government, non-profit or private sector, successful. How would the Senegalese Ministry of Education benefit from the creation of a CIO position? As in most ministries, and in non-profit organizations as well, limited resources such as human and financial capital are challenged by an overwhelming number of tasks to be accomplished. In Senegal there are thousands of schools, tens of thousands of teachers, hundreds of thousands of students and only one Ministry of Education (MoE) to manage it all. Prior to computerization the Ministry relied on paper-based data collection systems and intuition to manage the entire organization. A country like Senegal could not have afforded either a mainframe or mini computer to help manage its operations so it maintained old systems which worked but didn't necessarily work well. In Jamaica, we discovered that the Ministry of Health (MoH) actively used over 500 forms to manage its countrywide paper-based operations when perhaps as few as 40-50 might have provided the same operations. Without assessing the needs of the Jamaican Ministry of Health and implementing recommendations, the management was stymied by the laborious data collection and the MoH personnel was busy either filling out forms or trying to interpret the results. Data collection must be streamlined, make sense and provide the greatest utility for the management of the institution.

The microcomputer now possesses more processing power than the multimillion dollar mainframe or mini computer system and has become quite affordable. The Ministry has installed a networking infrastructure replete with servers and most people at the Ministry have computers capable of producing documents and crunching budgets. What is missing from this technological picture is a comprehensive Management Information System (MIS) which sits not only at the Ministry level, but also at the school and regional level. What types of information does the Minister of Education need to manage the entire Ministry and educational system. For example, how many books do the students at College Lamine Gueye need for the upcoming year? How are the needs of the schools quantified and then managed? The main business of an educational institution is the training of students and the management of such a process needs to be efficient and cost-effective.

What steps might the MoE follow to establish an Educational Management Information System (EMIS)?

1. Selection of a point person

The MoE may not be at a point where it is able to establish a Chief Information Officer position. If this is true, it should, nonetheless, identify a single individual who is capable of overseeing the task of moving the MoE into a unified MIS solution. This person needs to be able to interact with individuals at the school, city, regional and ministry level to determine the top 10 requirements of the education system. There may be thousands of requirements expressed by school officials and teachers but it will be the job of this person to triage the ten most important needs and then set about designing a system

capable to address those needs. The reality is that an EMIS will not resolve all issues but it likely to resolve the biggest management issues.

2. Selection of a Advisory Group

The person selected to organize the MIS approach, call this person the MIS director, should establish an advisory committee with whom he is able to discuss ideas and receive feedback. This group will not make the final decision about any initiative but it will listen to the ideas of this point person and then provide important feedback which may or may not be incorporated into a working plan. The biggest requirement of the individuals who comprise the advisory group is "buy-in" – these individuals sit at the various levels of the educational system, and will need to collect the information and use the new tools. They need to understand that modifying management will make a positive difference in their daily activities. The MIS director needs to promote technology as an opportunity to relieve staff of some of the mundane activities. For instance, the MoE may decide to locate all its forms on a portal website. Those who have access to the web will be able to download specific documents and then send them back to the Ministry using Internet-based technology. This will save time for many people and provide them with electronic access to forms reducing the need to go to Dakar to collect forms or have them mailed. Unfortunately there will be a percentage of people who do not have access to the web due to lack of Internet connectivity but the Ministry might be able to send a more simplified form via text messaging on a cell phone which can be filled out and returned. The MIS director will be the person who understands how technology can make a difference and be the *Pied Piper* for technological change for this select group of individuals.

3. Timeframe

In the United States this point person would be given 3 months to devise a plan of operation. In Senegal six months may be more appropriate given the difficulties of travel and communications. This person should, within the first 60 days, build a framework of the perceived needs of the Ministry in terms of the information it needs to manage the schools and the expressed needs of the school administrators and teachers as to what they need to manage the schools. The framework should then be vetted by the Minister's office to make certain that there is concurrence of purpose. At the same time, the MIS director will also make an inventory of all the technological tools at all levels to have a complete picture IT capacity within the educational system.

4. Process

Upon completion of both steps the MIS director will then select the "Top 10" needs of the Ministry and determine the best technological approaches to best meet those needs. This will include meeting with technology providers and analyzing which systems are the most appropriate for meeting the information requirements of the MoE. The MIS director will have 3 months to perform this work and then the final month will be spent writing.

5. Delivery of Plan to the Minister

While there may be unexpected delays in the process, the MIS director should have implemented within 6 to 8 months a plan of action which can be divided into three basic chapters:

Discovery – this is an explanation of the steps the MIS director took during the first 60 days to discover the needs of the MoE. This section will include of a list of individuals interviewed; an inventory of the tools presently in place or planned for future needs; an inventory of the personnel who are most capable of supporting the implementation of a comprehensive MIS solution; and the selection of the "Top 10" requirements as determined by the MIS director.

Discussion – This chapter will provide a comprehensive discussion of each of the "Top 10" needs and then express the best technological approach. This section is not concerned with the costs associated with meeting the requirements but is a statement of what the MIS director perceives as the "Top 10" MIS issues confronting the MoE.

Direction – This chapter describes how the MIS director will handle the challenges of the Ministry to tackle and then resolve the "Top 10" issues. This is also where the MIS director takes a stand and promotes a specific action plan to create a Ministry-wide MIS solution over a very specific period of time and estimates the costs associated with such a plan. The MIS plan will lead with the easiest obtainable objective and progress towards the most difficult element to resolve.

6. Current Situation

In most developing countries, and some developed countries as well people or groups on the "edge" of any organizational structure are often the least noticed and the most likely to have to develop certain survival skills. There are school districts in Senegal which have gone their own way and adopted systems which best serve their perceived needs. These districts will likely resent the establishment of a centralized MIS and not comply with new requirements. The MIS director will need to at least be aware that there will be school districts which have spent their own resources to buy their own IT solutions. Just as the middle of a bridge cannot be built before the beginning and ends are put in place, the MIS director will need to build the appropriate bridge between the Ministry of Education, the Regional Offices, the cities, the school districts and then the schools. This is a large task. In the United States a state will have its own CIO in its education department; there will also be a CIO at the county level, at school district level and sometimes even at the school level. Collaboration among the levels can be challenging. In Senegal the MIS director can be very creative with the "Top 10" initiative and recommend pilot projects around the country to improve the overall management of the information system.

It will likely take two to three years before the MIS is fully integrated into the MoE, and even then, the outliers – the schools located in the "last mile" – will remain "offline" and

require a separate approach to complying with the MIS plan. While two to three years may seem like a long time for the implementation of a comprehensive nationwide MIS plan, the eventual result will allow the MoE to manage information and the entire educational system more affectively.

7. Practical Applications

Web Portal

In Macedonia, two USAID funded activities were given the task to design a web portal for the Ministry of Education. USAID provided the capital to build a national wireless Internet service connecting each school. The stated goal was to provide a web-based "location" where school administrators, teachers and student could go and find forms, have their questions answered, communicate with like-minded individuals through web-based forums and basically find any type of information related to the school system in Macedonia. In addition, during the design phase parents were also provided for: they could join other parents in group forums and learn about schooling requirements and special events. The question was how to get people to use this site and the answer was to make it a site that administrators, teachers and students went to when accessing a built-in web-based email system to collect and send emails. It worked quite well with over 35,000 accounts created in the first 90 days. The live group discussions also brought people to the site. The web portal provided teaching tools for teachers to access and download and use within the classroom. One such tool was an automated grade book where teachers would enter their students' test scores allowing parents to see the scores online.

Computers for Schools off Power Grid

Senegal experiences periodic electric power outages in the capital of Dakar and more acute power outages around the country. This presents problems for the deployment of power-sensitive equipment like computers and other electronic devices. In addition, there are a significant proportion of schools without electricity . These schools are likely the most remote? rural in the Senegalese school system. There is a solution for this type of environment called "low power computing." The deployment of solar panels combined with extremely low power-consuming computers will support a computer room operation. A US-based company, Inveneo, produces a low power-consuming computer solution under the auspices of both Intel and AMD, the biggest computer chip makers in the world. Inveneo could work with local Senegalese partners to calculate the right solar panel requirements to support computers in a school. The computers cost approximately $450 per unit if bought in quantity and $550 if purchased in smaller quantities.

The Project d'appui a l'enseignement moyen (PAEM) project with the support of the MoE might select several schools to serve as pilot testing sites for a low power computing solution. Given the low power use of these computers combined with a solar panel approach, these systems will be able to work throughout a school day and beyond, and allow a school to keep open computer rooms for after-school (homework)

requirements. Inveneo is presently supporting installations in Uganda, Rwanda, Ghana, Mali and Guinea Bissau for schools which have low or no power.

Internet Access for Rural Schools

There is a way to extend Internet access beyond the present boundaries in Senegal through the use of broadband wireless communications. In Macedonia USAID supported the Macedonia Connects project which provided connectivity to 460 schools and 95 additional sites through the development of a wireless backbone system extending out to the furthest reaches of the country. The incumbent internet and telephone provider was unable to provide Internet access outside an urban setting. Macedonia Connects established a public-private partnership (PPP) among (between is used for 2, among for 3+ entities) the ??? itself, a competitively selected Internet service provider and USAID.

A similar activity would be possible in Senegal which could provide wireless internet access to schools and extended to selected "last mile" schools – those schools well beyond the telecommunications grid. Mobile telephony has extended the range of communication throughout Senegal and a similar solution could provide Internet access to schools. Such an activity would need to be well planned and rely on an agreement between a selected Internet provider and Sonatel.

There are manifold benefits to providing Internet access to a school. The teachers can enhance their own skills and use the Internet to supplement their lesson plans. Students learn about the world beyond their own environment and gain access to the largest library in the world. Administrators find tools which help them manage the school and develop the talent of its teachers .

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Inveneo Article

San Francisco, California. April 17, 2007 – Inveneo Inc, a non-profit social enterprise, has partnered with the BOSCO (Battery Operated Systems for Community Outreach) Uganda Relief Project to provide access to computers, the Internet and VoIP telephony for Northern Uganda's Internally Displaced Persons (IDP) camps. The BOSCO Uganda Relief Fund partnered with Inveneo to provide and deploy Inveneo's solar-powered Information and Communications Technologies (ICT) System to give Caritas and Catholic Charities, and the isolated IDP-camp communities they serve, a vital link to the outside world. This phase of the project serves nearly 100,000 people and provides a communications network of computers and telephones connected via long-range WiFi for multiple locations in seven IDP camps and the Archdioceses office in the city of Gulu.

Inveneo, with funding from BOSCO, has designed and installed a high-speed local-area network using long-range WiFi networking devices, ultra low-power computers and VoIP telephony for Caritas/Catholic Charities. The Inveneo network is powered via solar panels which power battery arrays. Internet connectivity is carried from the city of Gulu via the Inveneo WiFi network to the IDP camps up to 70 Kilometers away. The system is specifically designed to be operable on 12 volts with a range of power options, and is resistant to heat, humidity and dust – so that it can operate in environments where computing has traditionally not been found. It has been designed for ease of use for both users and administrators who are new to technology.

BOSCO saw the potential for communications to transform daily activities in the camps, where few phones and no power exist today. They were searching for a cost- and power-effective solution when they found Inveneo. This phase of the project will connect eight Archdiocese offices, two clinics and 17 schools. The network will be used for all types of communications needs, including logistics, emergency notification, school-teacher training, consultations between clinics and doctors, communicating with American and European donors, and getting out critical information on human-rights violations

"The Diocese will be more efficient in its support of the people with the new ability to communicate immediately with other offices in the camps and funding organizations in the United States and Europe," said Archbishop John the Baptist Odama of the Northern Uganda Archdiocese, where the IDP camps are located.

"Many of Uganda's adults, and especially its children, have suffered greatly due to a war that has lasted more than 20 years. We believe that providing affordable, sustainable communication technologies to the organizations which serve them, like those provided by Inveneo, can change the lives of these people in dramatic ways – simple ways that so many of us take for granted," said Ted Pethick, Navitor Systems of Indiana, the Technical Director and Designer of the BOSCO Project.

"Inveneo is dedicated to helping to improve people's lives through ICT solutions that help to connect them to world around them. ICT relieves their isolation and opens opportunities," said Mark Summer, CEO of Inveneo. "It can provide the ability for people to call the clinic when there's been an accident, it can enable camp teachers to access better teaching tools on the Internet, and it can simply provide much greater ability to perform day-to-day logistics for the Catholic organizations."

The BOSCO Relief Fund Project is planned to extend to 60 IDP camps in Northern Uganda within three years. These 60 camps (of the 104 camps in total) will become trading centers after the conflict ends and the people are able to return to their homes. The Inveneo systems will provide access to life-changing ICT, directly or indirectly to nearly two million people. The project has been funded by donors from the US to date. Gus Zuehlke of the Saint Bavo Catholic Church in Mishawaka, Indiana is the President and Founder of BOSCO and is leading the fund-raising effort. "The longer term plan is to extend the network to reach the homes of the people once it is safe for them to return," said Mr. Zuehlke.

The project has also gotten the attention of the Ugandan government. "We intend to make every effort to support this project, which gives a voice to our people that had been cut off from the outside world," said John Alituma Nsamba, the State Minister for Information and Communication Technology in Uganda.

About BOSCO Uganda Relief Fund

The people at BOSCO have developed a plan to provide Internet access, computers and Voice-over-IP telephone service in the Internally Displaced Persons (IDP) camps in Northern Uganda. These camps were developed with the intent to provide safety in numbers. Sadly, 95% of the people in this area are living in absolute poverty and are unable to tap the vast natural resources of the area. Currently, two million people are living (and starving) in these IDP camps in the provinces of Gulu, Kitgum, and Pader. The goal of this project, code named BOSCO: Battery Operated Systems for Community Outreach, is to give these forgotten people, especially the children, a voice. This technology will link these people to the outside world and allow them to become their own advocates. For more information on the BOSCO Uganda Relief Project or to make a donation, visit www.bosco-uganda.org.

About Inveneo

Inveneo is a non-profit social enterprise whose mission is to get the tools of information and communications technology into the hands of organizations and people who need them most --those in remote and rural communities in the developing world. For more than 2.5 billion people living in these communities, gaining access to Information and Communications Technologies (ICTs) -- either directly or via service organizations -- can transform their lives in simple yet profound ways. Access to ICT can help save lives

(rural healthcare), provide better economic opportunities (agriculture, entrepreneurship) and provide a better future for their children (education).

To date, Inveneo has 20 projects completed or underway in Uganda, Rwanda, Ghana, Mali, Guinea Bissau and Burkina Faso. These projects serve schools (50%), economic development groups, telecenters, and relief camps in 66 communities. They will reach over 160,000 people, directly or indirectly, with life-changing ICTs. Our goal is to serve over 4,000 communities in the next three years. For more information, visit .

Macedonia Connects Article

A US-funded project to build a wireless nation will ease the country's interethnic conflicts.

By Beth Kampschror | Correspondent of The Christian Science Monitor

SKOPJE, MACEDONIA - Just five years ago, Macedonia was the flash point of the former Yugoslavia's last conflict, when ethnic Albanian rebels clashed with Macedonian security forces for several months before signing a peace agreement in August 2001.

Now Macedonia may be the world's first all-wireless Internet country, where Internet access is available to virtually anyone with a wireless-enabled computer. Project associates say it's helping schoolchildren, breaking up the Macedonian telecom monopoly, and paving the way for Internet-based businesses to start replacing Macedonia's outdated textile giants and factories.

Improving the economy could also help the country move on from the 2001 conflict while providing a role model for the region's many war-torn nations.

"Prosperity takes precedent over interethnic rivalries," says Teresa Albor, a spokeswoman here in the capital for the United States Agency for International Development (USAID), which invested $3.9 million in the project.

USAID had previously funded local-area networks for Macedonian schools, which were already equipped with 6,000 computers donated by the Chinese government. After that foundation had been laid, USAID funded and founded the Macedonia Connects Project, which hired a local company - On.net - to provide wireless access for all of Macedonia's schools.

By September 2005, the project was completed, establishing a "backbone" of wireless access for the whole country. From that main network, On.net uses Strix Systems radio-mesh technology to create Wi-Fi "clouds" around towns and villages throughout the country. Anyone with a laptop can buy a card with wireless credits, click on "find wireless networks," and get online.

"People will be able to view the various wireless solutions within any given spot in Skopje or Bitola and connect to the Internet just as you might in New York City or Tempe, Ariz.," says Macedonia Connects project director Glenn Strachan.

Wireless access is available to about 95 percent of Macedonians, even those living in remote sheepherding mountain villages where people don't have phones. But because of a lack of computers, funds (the average annual income is $2,350), or interest, only 8 percent of Macedonians have Internet access.

The first Macedonian school to go wireless was an all-Roma school in Sutka, just outside Skopje. Sutka, where rows of metal-roofed shanties are separated from stone mansions by only a muddy lane, is thought to be the largest Roma (sometimes referred to as Gypsy) community in the country. School director Saip Iseni says the Roma benefited from the education minister's wariness about whether to connect an Albanian or Macedonian school first. After civil war nearly divided the two ethnic groups, the minister could be accused by one community or the other of playing favorites.

"So they came to us, so no one would get angry," Mr. Iseni says, laughing.

Joking aside, tensions still exist between Macedonia's ethnic Albanians and Macedonian Slavs, who live in their own villages and often parts of towns. Children go to separate schools, or to the same school in different shifts.

Aleksandar Bilbilov, applications director for Macedonia Connects, says the project helps Macedonia's growing IT businesses, like Web design and animation for Western companies.

"If you're doing some animation for Coca-Cola, you can't say to them, 'Let me burn this on CD and FedEx it to you' - it doesn't work that way. You need a high bandwidth to send it," he says, emphasizing the importance of wireless access in the information age.

Milivoje Gjorgjevic, production manager for the Skopje-based company 3XFX, says On.net has been invaluable for offering such high bandwidths. The firm has done effects and animation for Hilton Hotels commercials and the Steven Spielberg film "The Aviator."

"It's easy in Paris or London to get a super nice connection but in our country it's not that easy," he says. "It was impossible to get that connection three years ago - even today we cannot go to the telecom and ask for this type of connection."

And On.net is creating some competition. At about $25, On.net's basic ADSL package - a fast Internet connection over existing phone lines - is half the price of the same package from the state telecom giant Maktel.

Mr. Strachan says he hopes On.net's work can be a blueprint for other countries that, like Macedonia, are small and geographically isolated, but have relatively good telephone, road, and electricity infrastructure. A delegation from Montenegro visited in March, and Strachan has been to Georgia to talk to government ministries about connecting some 2,700 schools there.

People involved with the project see it as a way for Macedonia's economy to jump out of what development workers call the "transition" phase, from a planned economy to a market economy. But despite the advantages for schoolchildren - of all ethnic groups - and IT businesses, those who lack the means or desire to acquire computers are left behind.

"I've got a 26-year-old son at home - he's young and intelligent, and he doesn't have a computer, though he'd like to have one," says Rade, a gray-haired man smoking with his friends at Skopje's Biser marketplace. Selling flowers a few feet away, recent high school graduate Aleksandar says, "I'm not interested in that kind of stuff. I'd rather have a motorcycle or a car."